1. Why do we bother with university?

University gives you the opportunity to study what you like! If you are unsure, you can take a range of topics from chemistry to biology to computer science to languages to find your passion. Not only do universities provide more information and insight into groundbreaking things such as genetic engineering, they also provide you with a comprehensive social life and many volunteering and other opportunities which introduce you to wonderful people and teach you skills you need not only for finding a job, but for navigating through life itself.

2. What do we do in the university?

We study in different classes, just like in school, but we also do other extra-curricular activities – these are very diverse, ranging from dancing and other performing arts, to community activities such as volunteering for WorldVision and other charities. University also presents you with many projects that you can undertake to help prepare you for the workforce or just for fun.

3. What is molecular biology, genetics, genetic engineering and synthetic biology?

Biology is gradually shifting from a focus on whole organisms such plants and animals to instead focus on the molecules that make these organisms (e.g. DNA, and proteins). One important application of biology is in genetic engineering (synthetic biology). Genetic engineering may provide answers to problems such as climate change, world hunger and production of clean energy. With unpredictable climate, we can use GMOs to create more drought-resistant crops i.e. grow with less water, or create crops which grow faster and have more nutritional value. We can make GMOs which can produce fuel for us. Furthermore, we can use GMOs and genetic engineering technologies to treat diseases, e.g. by gene therapy, where we change the faulty gene into its proper form.

4. What is iGEM?

iGEM is an annual international competition where teams from universities across the world have to utilize synthetic biology to address a problem in society. As part of the competition, we have to create a new GMO, use mathematical modeling to predict the output of our system and also do outreach programs to introduce the ideas of synthetic biology to society outside the university and highlight its importance in the modern world. The point of this is to prepare future generations to be able to use genetic engineering to solve real world problems, to understand the possible risks of these technologies, and to encourage "open source" science based on sharing and collaboration.

5. What are we doing for iGEM? – "MycoMimic"

Traditional chemical methods have always been very limited in the range of products they can synthesise. The main challenge is to create highly pure and homogenous samples which can be suitable for variety of sensitive applications, which is especially very crucial in pharmaceuticals. Some pharmaceutical chemicals have a "right-handed" and a "left-handed" form – usually only one of these is useful, and the other may actually be toxic. Making just a single form of the chemical is difficult to do, but one way to solve this problem is via biocatalysis: ie. using microorganisms such as bacteria to make the desired compounds for us. Some microorganisms can produce just the left-handed or right-handed form of chemicals with high selectivity and efficiency. In order to direct a microorganism to produce the intended chemical, we have to change the genetic information used by the organism by genetic engineering..

In our case, we are trying to introduce a useful gene from a bacterium called Mycobacterium to a more easily-handled bacterium, *E.coli*, to synthesise a class of compounds called 'epoxides' for us. It is hoped that by developing this genetically modified *E.coli*, we can produce just the 'left-handed' form of a chemical called 'indene oxide' which is used for making anti-HIV drugs. This chemical is very expensive because it is hard to synthesise. By making indene oxide in bacteria, we can address the high demand for this chemical and make it available at cheaper prices to assist in the fight against the HIV virus.

In order to achieve this, our team is using genetic engineering techniques (gene cloning) as well as computational modelling to design the best system possible for the synthesis of indene oxide. It is hoped that the combination of modelling and genetics can successfully lead to a well-designed genetically modified bacteria which can produce this useful compound at high yields and in large-scale industrial production.

For more news and information, like our Facebook and enter the competition!
Facebook: The University of Sydney IGEM Team 2015